NASA Earth Observatory

ARSET Air Quality Applications Webinar

Adam Voiland, Science Writer
Science Systems and Applications, Inc.
adam.p.voiland@nasa.gov
@avoiland

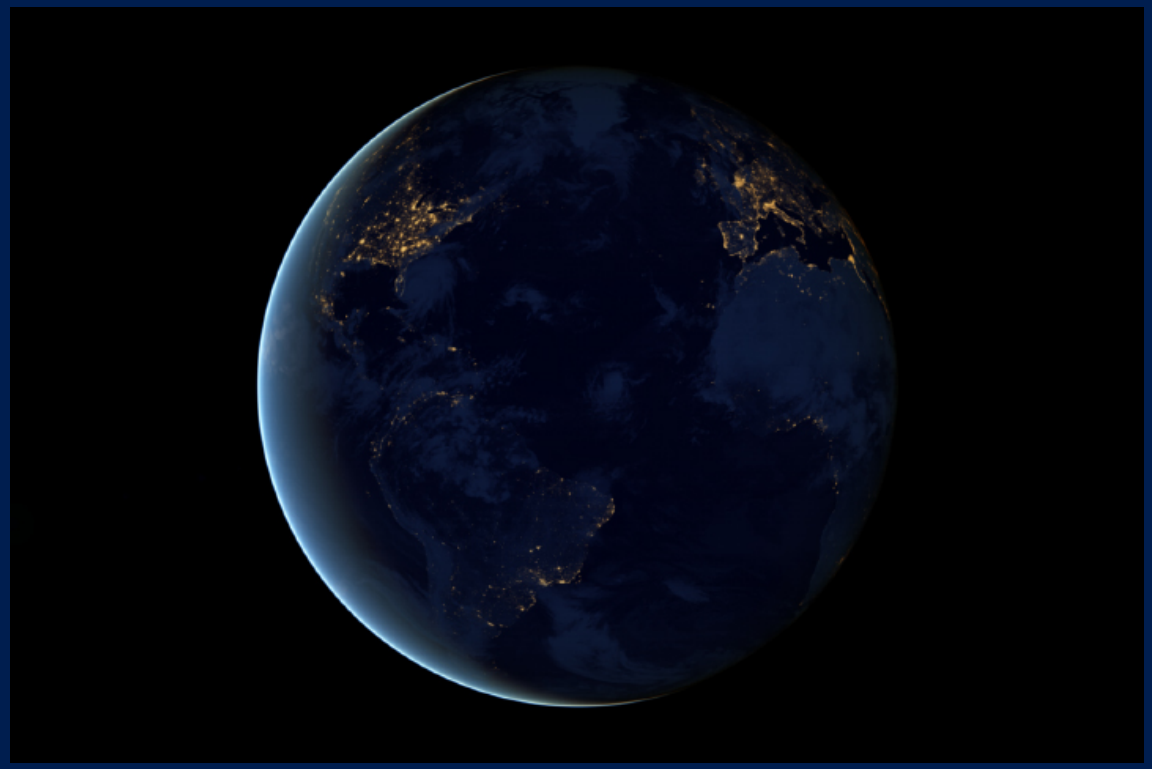
April 8, 2015

Mission

The Earth Observatory's mission is to share with the public the **images**, **stories**, and **discoveries** about the environment, Earth systems, and climate that emerge from NASA research, including its satellite missions, in-the-field research, and models.

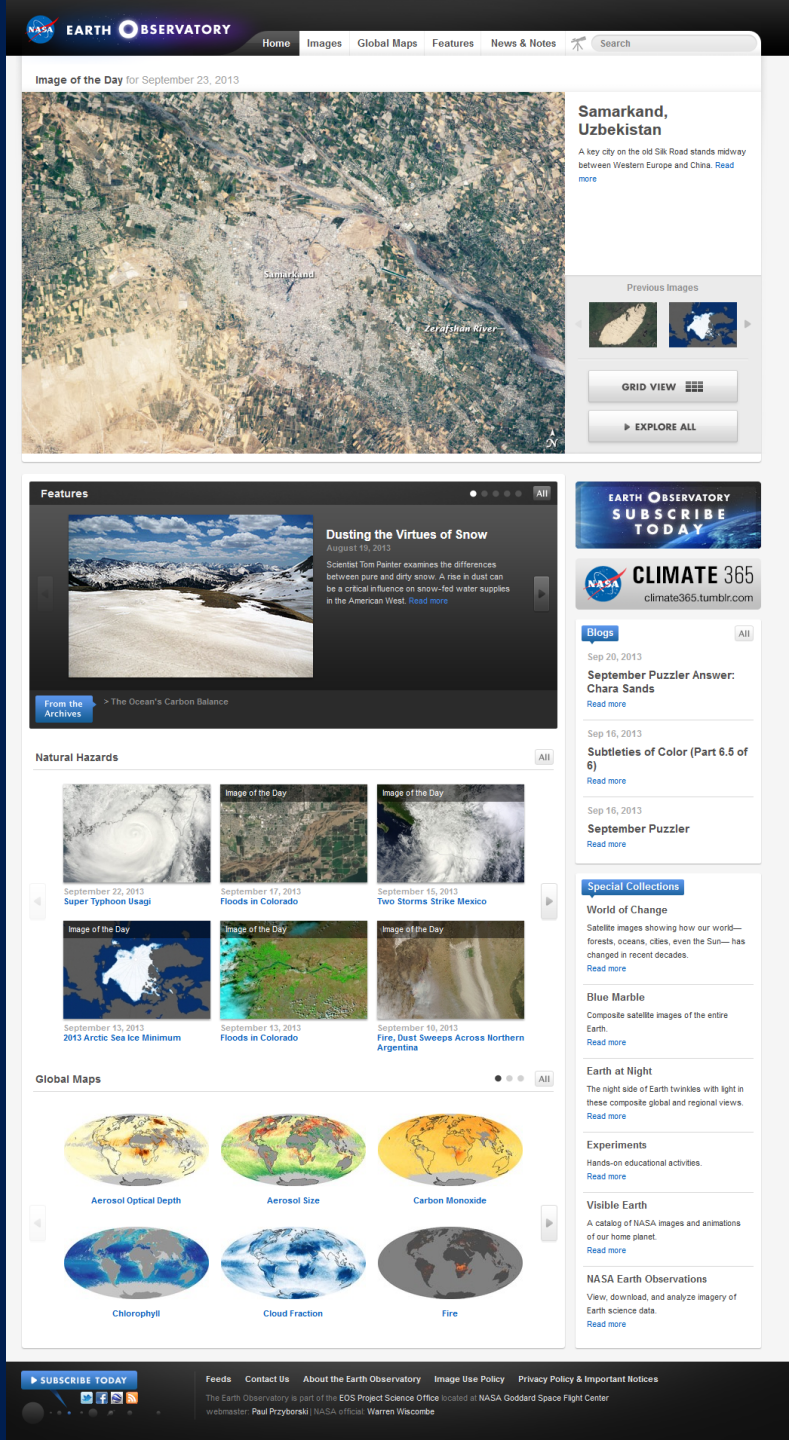
What we do

- Image-based: “magazine style” storytelling for the web
- Daily still imagery and maps
- Daily coverage of newsworthy natural hazards (includes several categories that are relevant to air quality: haze events, wildfires, dust, volcanic eruptions)
- Feature length stories
- Social media

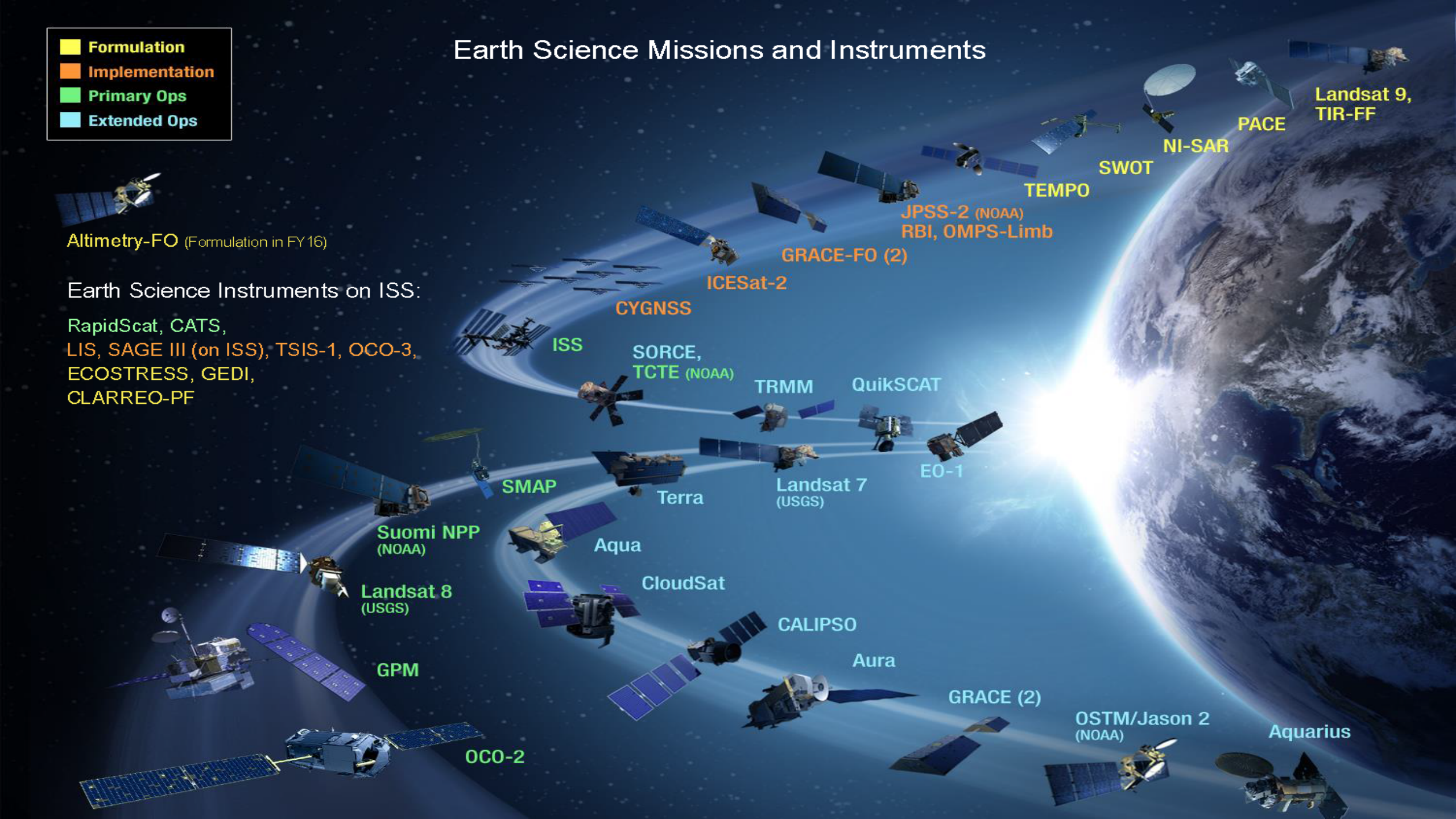


earthobservatory.nasa.gov

- 705k visitors/month
  - 7.9M visitors
  - 22.9M pageviews
- 79k email subscribers
  - 3 newsletters
- 6.5 million Facebook followers
- 434k twitter followers



Earth Science Missions and Instruments



Key Air Quality Resources from EO

- Natural Hazards Section

http://earthobservatory.nasa.gov/NaturalHazards/

- Image of the Day coverage

http://earthobservatory.nasa.gov/IOTD/

- Global Maps

http://earthobservatory.nasa.gov/GlobalMaps/?eocn=topnav&eoci=globalmaps

- Feature coverage

http://earthobservatory.nasa.gov/Features/

Natural Hazards Section

- Timely, breaking news. Usually imagery no more than a few days old
- Divided into sections: 1) fire 2) dust, smoke haze 3) volcanoes
- Goal of at least one new hazards image per day
- Straightforward, succinct captions.

Hazards Example: Holuhraun Eruption

- Event galleries
- Updated as we go with imagery from different sensors/ datasets

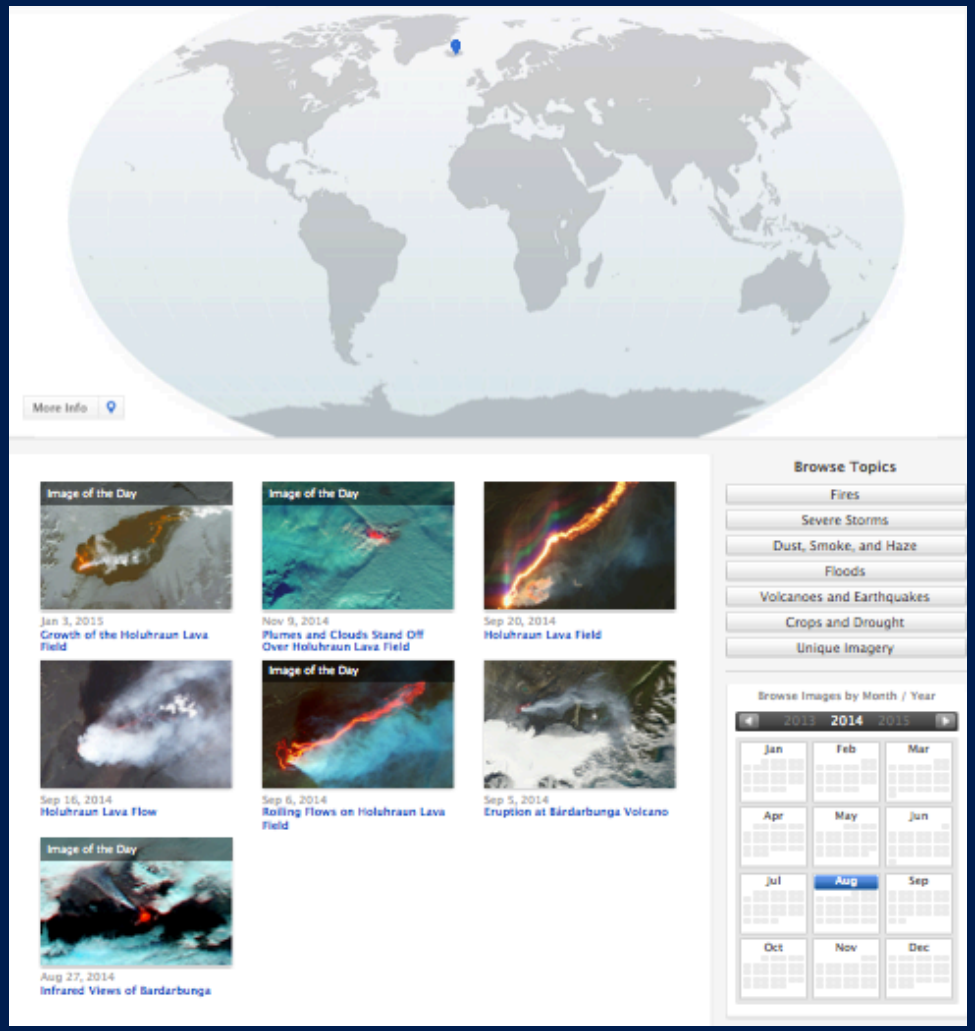
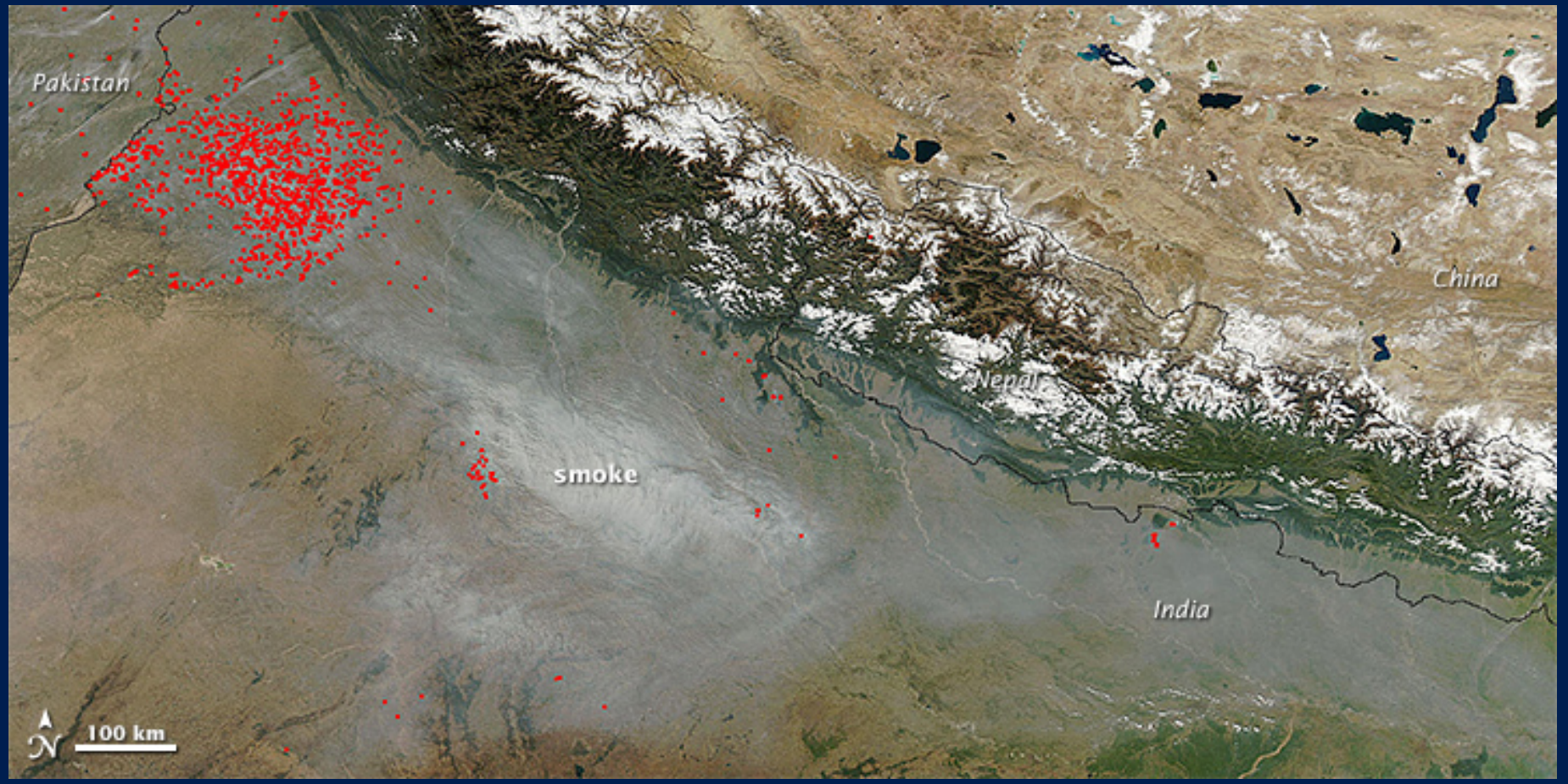


Image of the Day

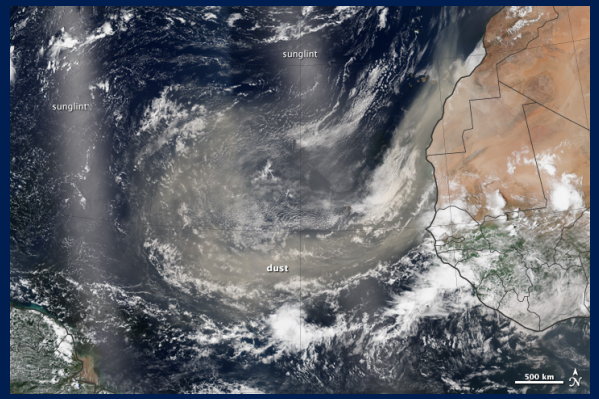
- Deeper stories. Often multi-image.
- Common data sources: MODIS on Aqua/Terra, OLI on Landsat 8, VIIRS on Suomi NPP, CALIPSO, OMI.
- Usually reported stories that include several references and links to sources of data.
- Examples: Seasons of air quality in India, New map of PM2.5, ship tracks in NO2

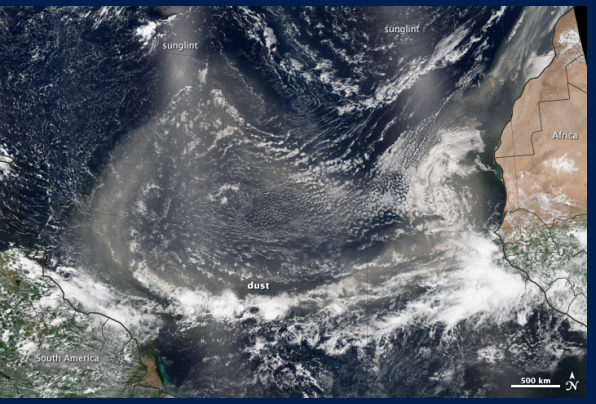
Example: Seasons of Indian Air Quality

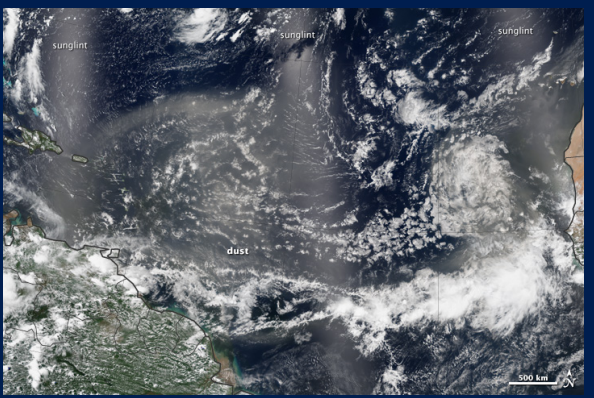


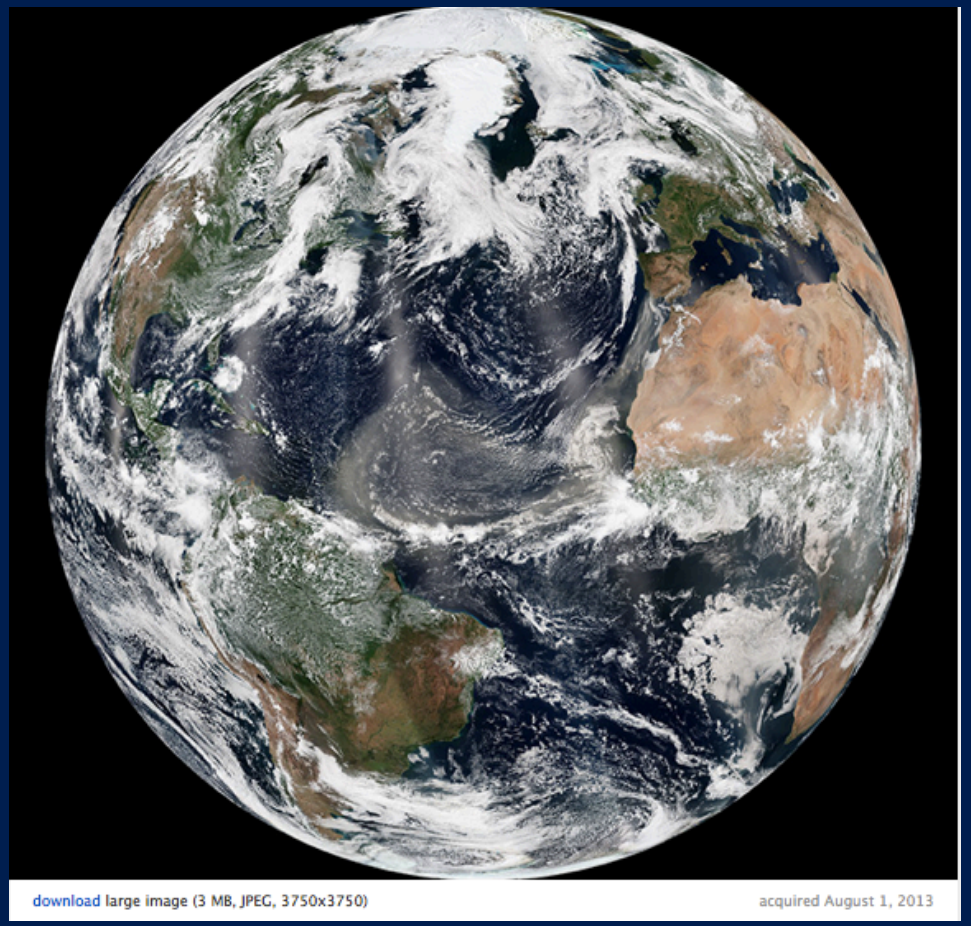
MODIS, 2014 http://earthobservatory.nasa.gov/IOTD/view.php?id=84731

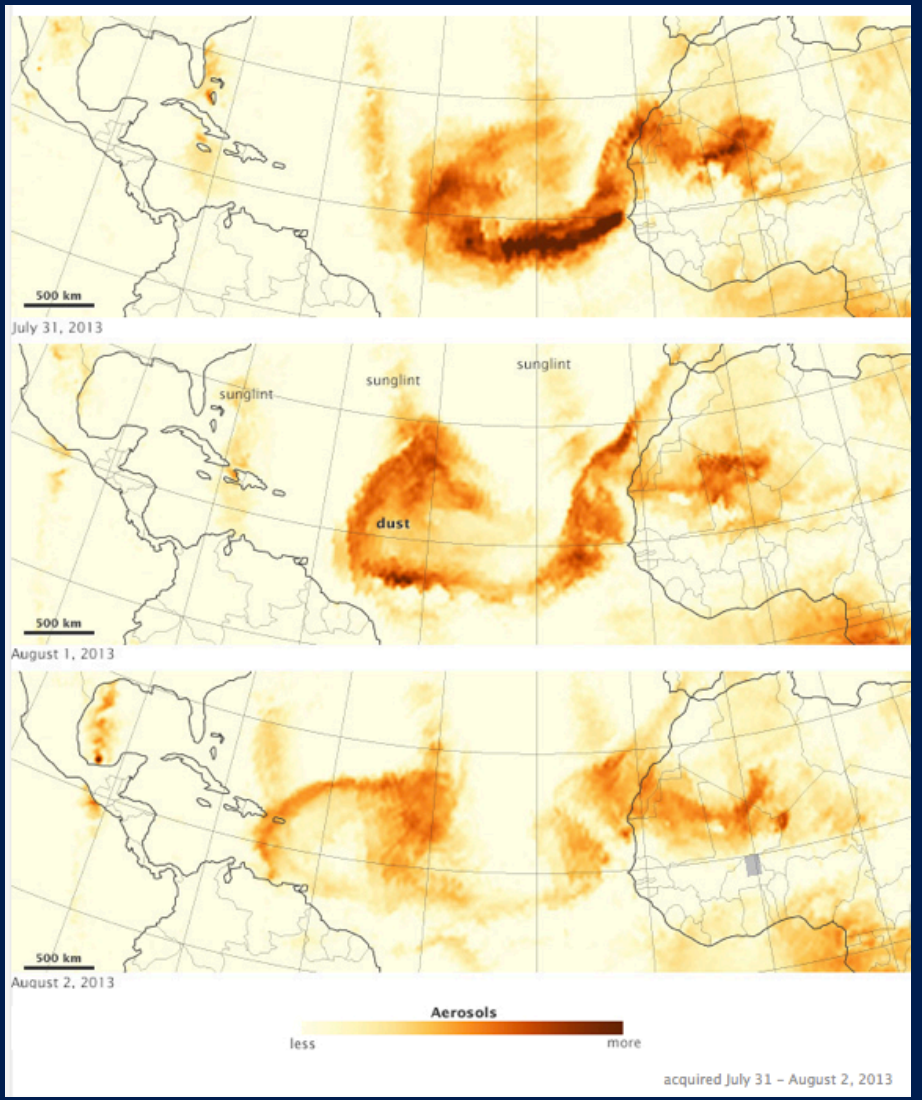
Example: Dust Crossing the Atlantic





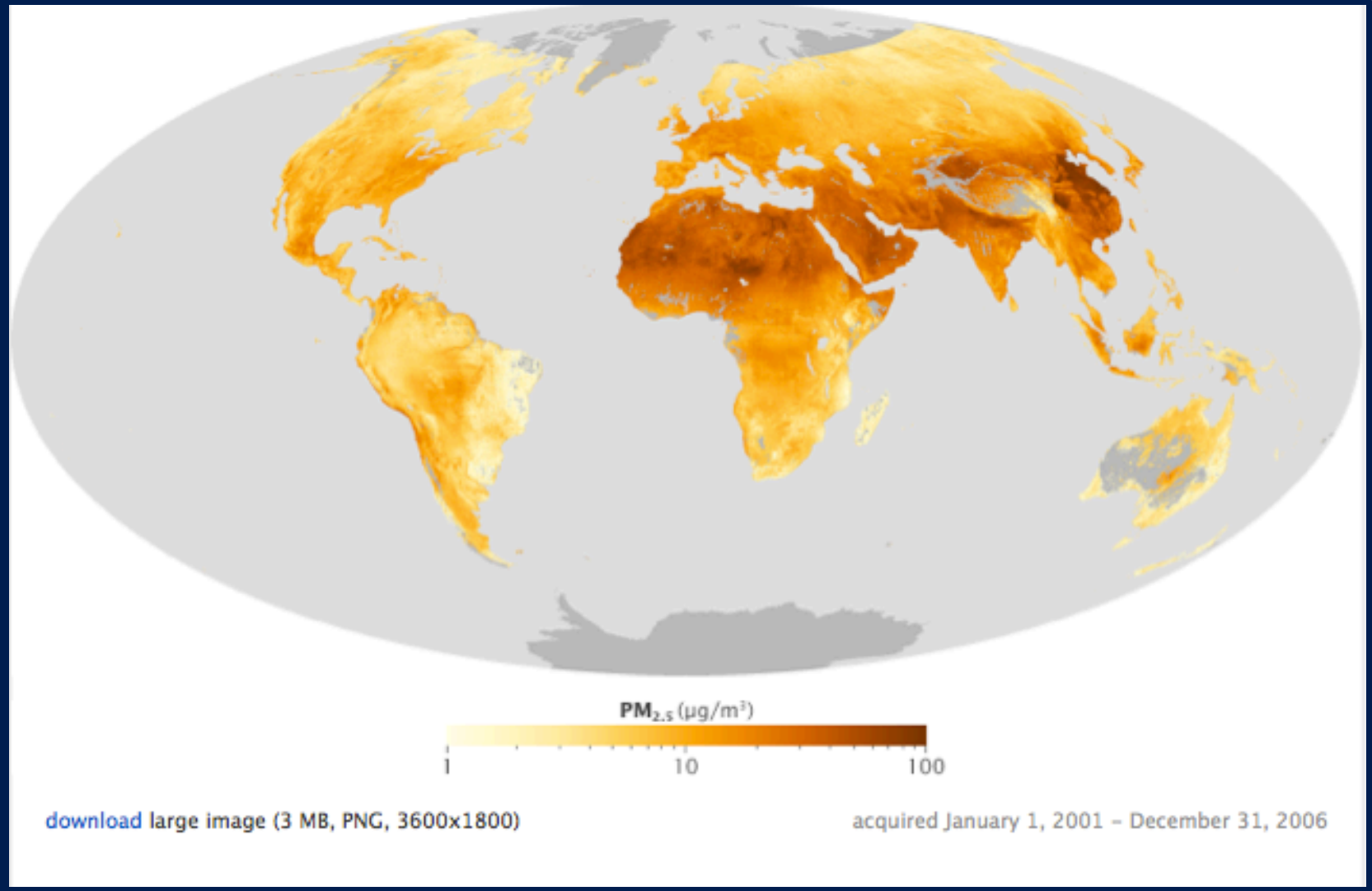






VIIRS, OMI, 2013 http://earthobservatory.nasa.gov/IOTD/view.php?id=81864

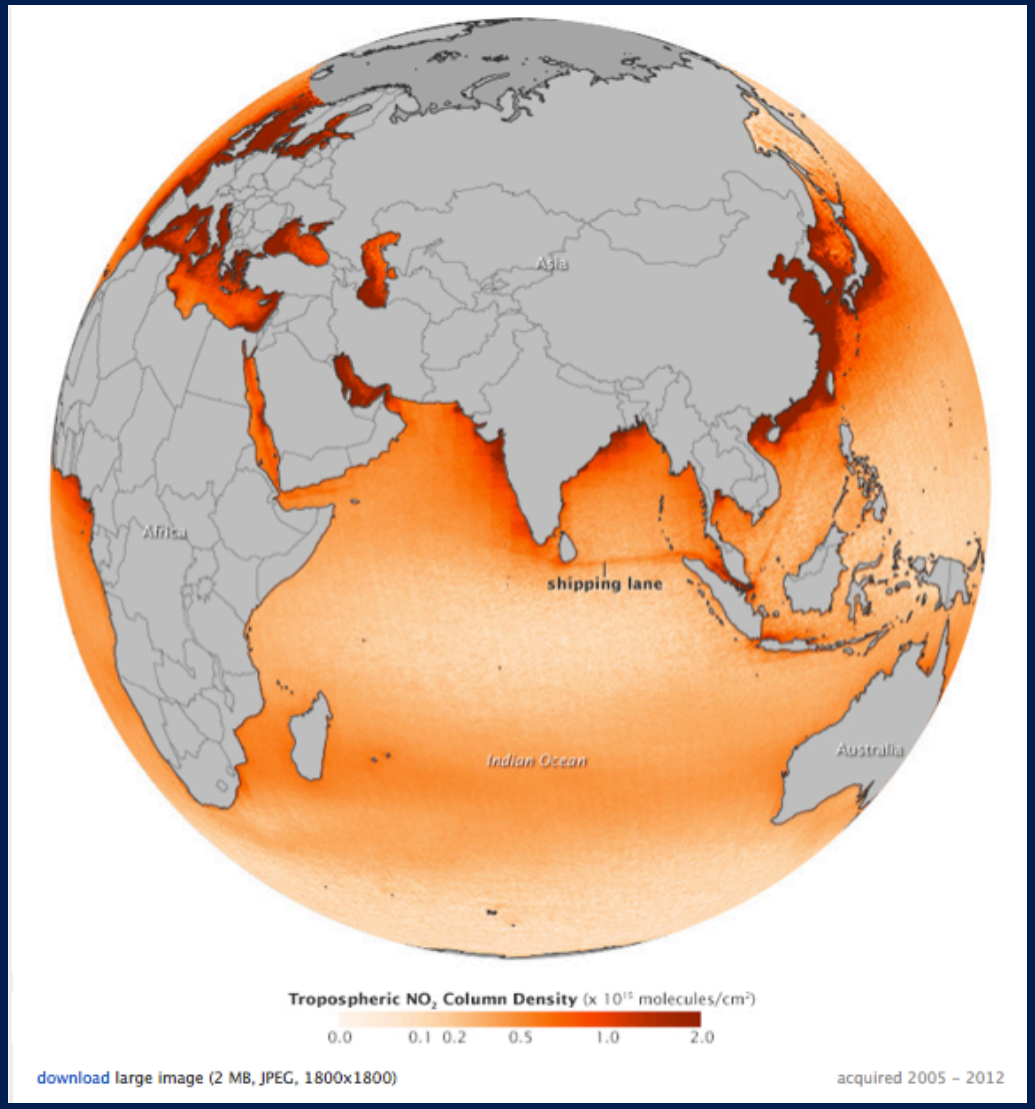
Example: New Map of fine $PM_{2.5}$



http://earthobservatory.nasa.gov/IOTD/view.php?id=84731

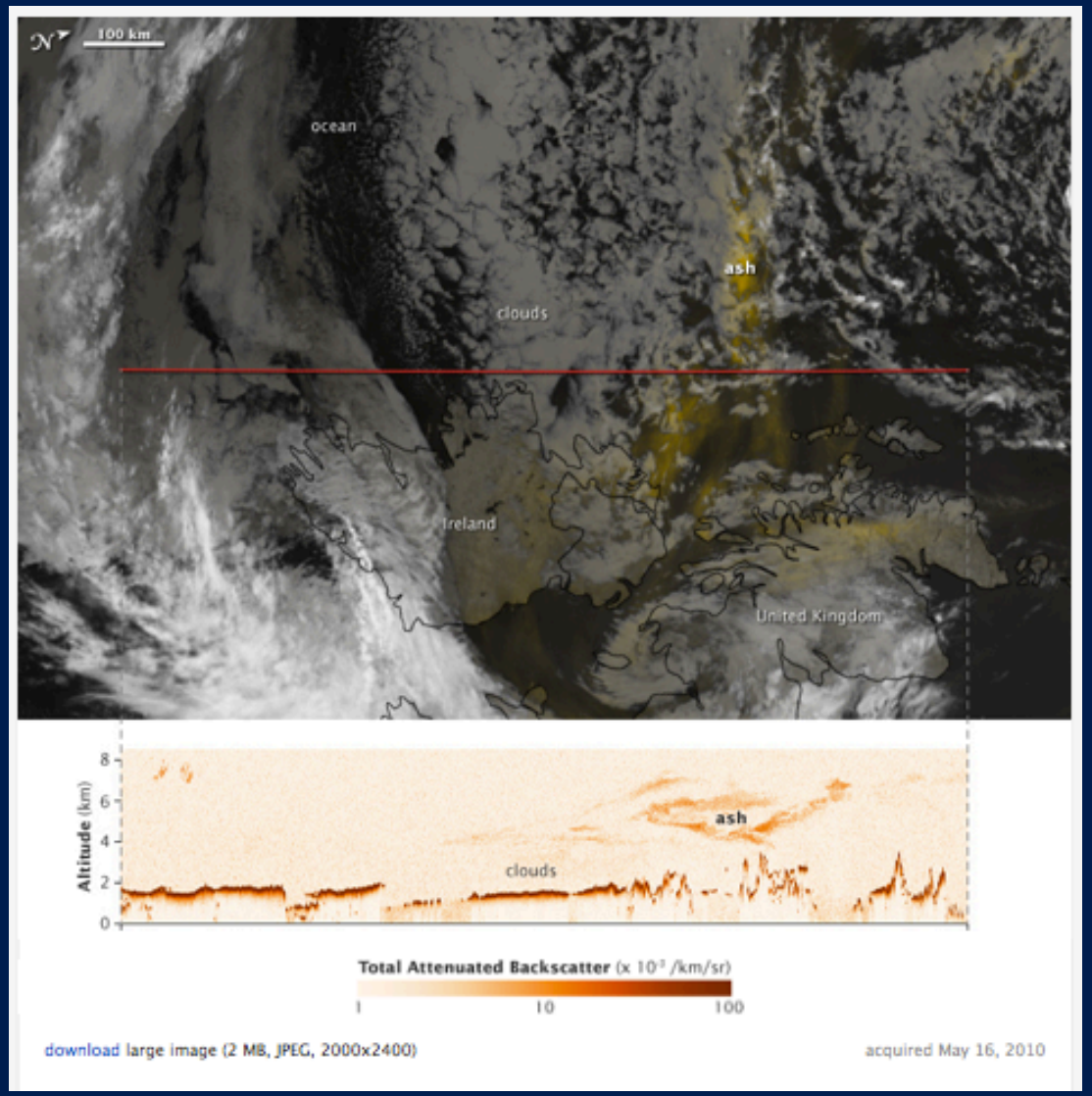
Based on MODIS, MISR data. Analysis by van Donkelaar et al, 2010 http://ehp.niehs.nih.gov/0901623/

Example: Shipping Pollution Map (NO_2)



OMI, 2005-2012
http://earthobservatory.nasa.gov/IOTD/view.php?id=80375

Example: Ash tracking with CALIPSO



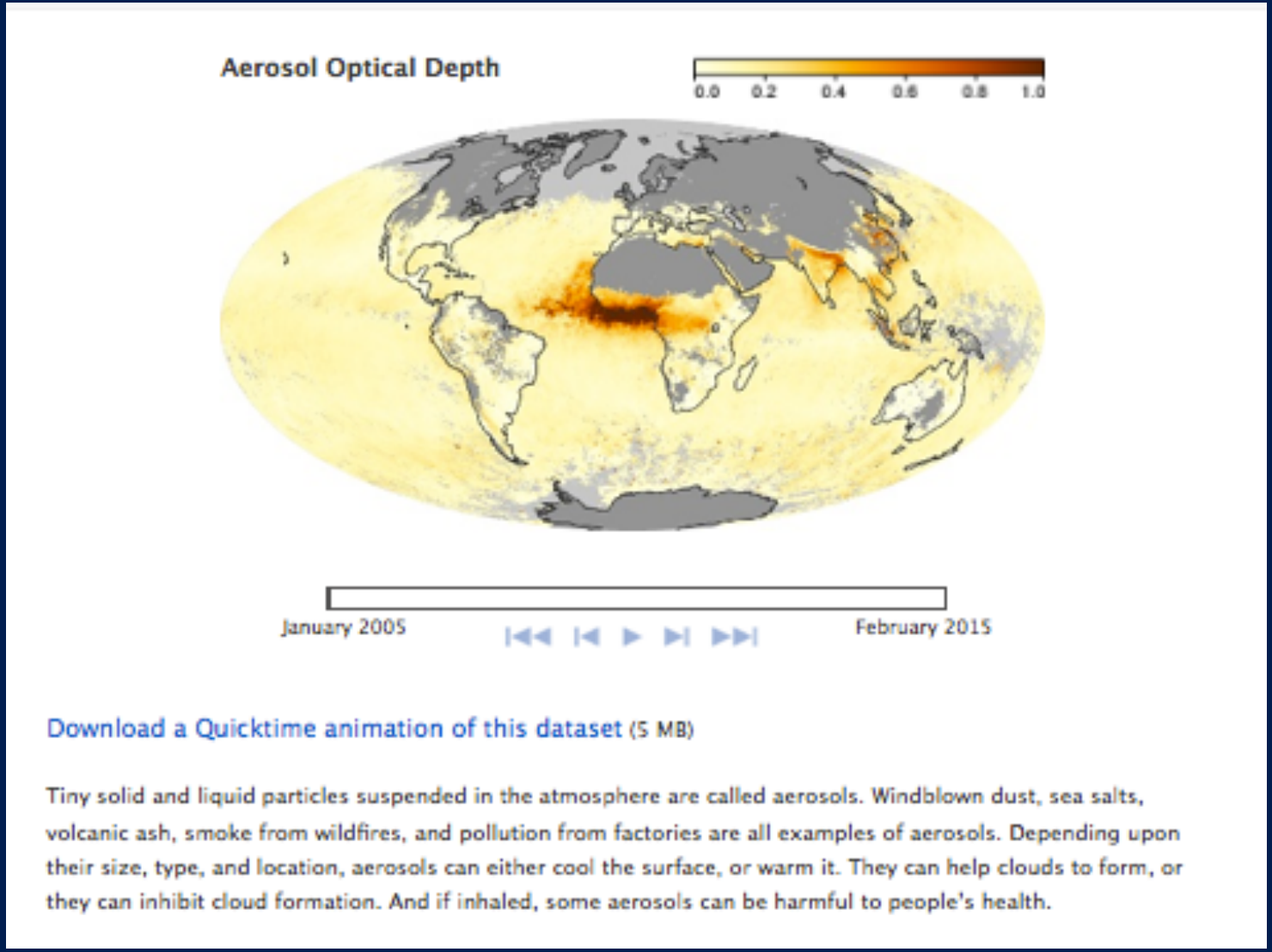
Eyjafjallajökull Volcano, 2010
MODIS, CALIPOP
http://earthobservatory.nasa.gov/IOTD/view.php?id=44052

Global Maps

- Regularly updated global maps of key NASA datasets relevant to air quality
- Presented as monthly averages.
- Quicktime animations include several years of data.
- Datasets include: aerosol optical depth (Terra MODIS), aerosol size (Terra MODIS), carbon monoxide (Terra MOPITT), fire (Terra MODIS)

Example of Global Map: Aerosol Optical Depth

MODIS, 2005-2015, monthly
http://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=MODAL2_M_AER_OD



Features

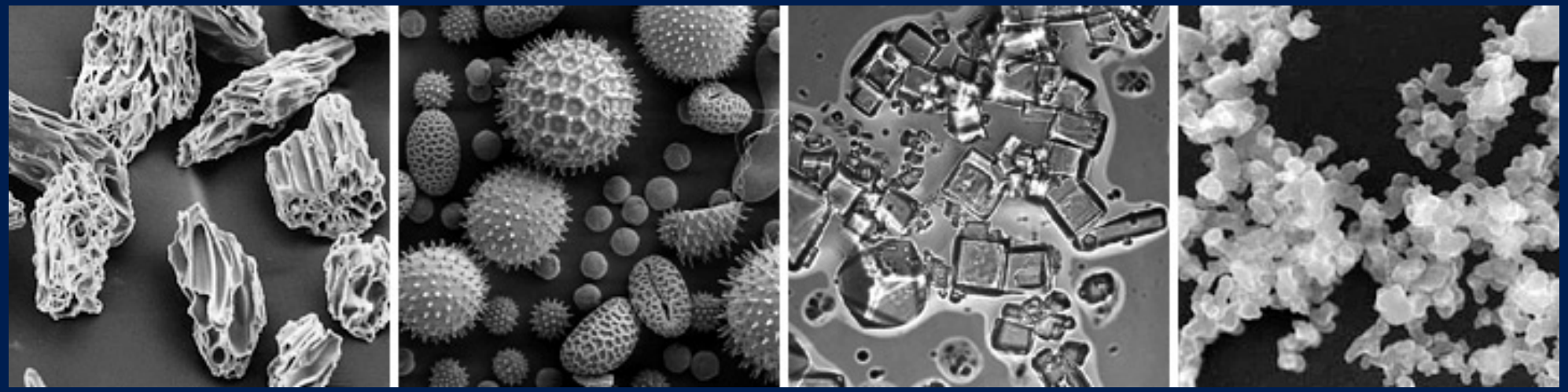
- Broad overviews. Intended for non-experts.
- 1) Aerosols: Tiny Particles, Big Impact (Primer)

http://earthobservatory.nasa.gov/Features/Aerosols/

- 2) Air Quality: A Clearer View of Hazy Skies (Aerosol Trends)

http://earthobservatory.nasa.gov/Features/AirQuality/

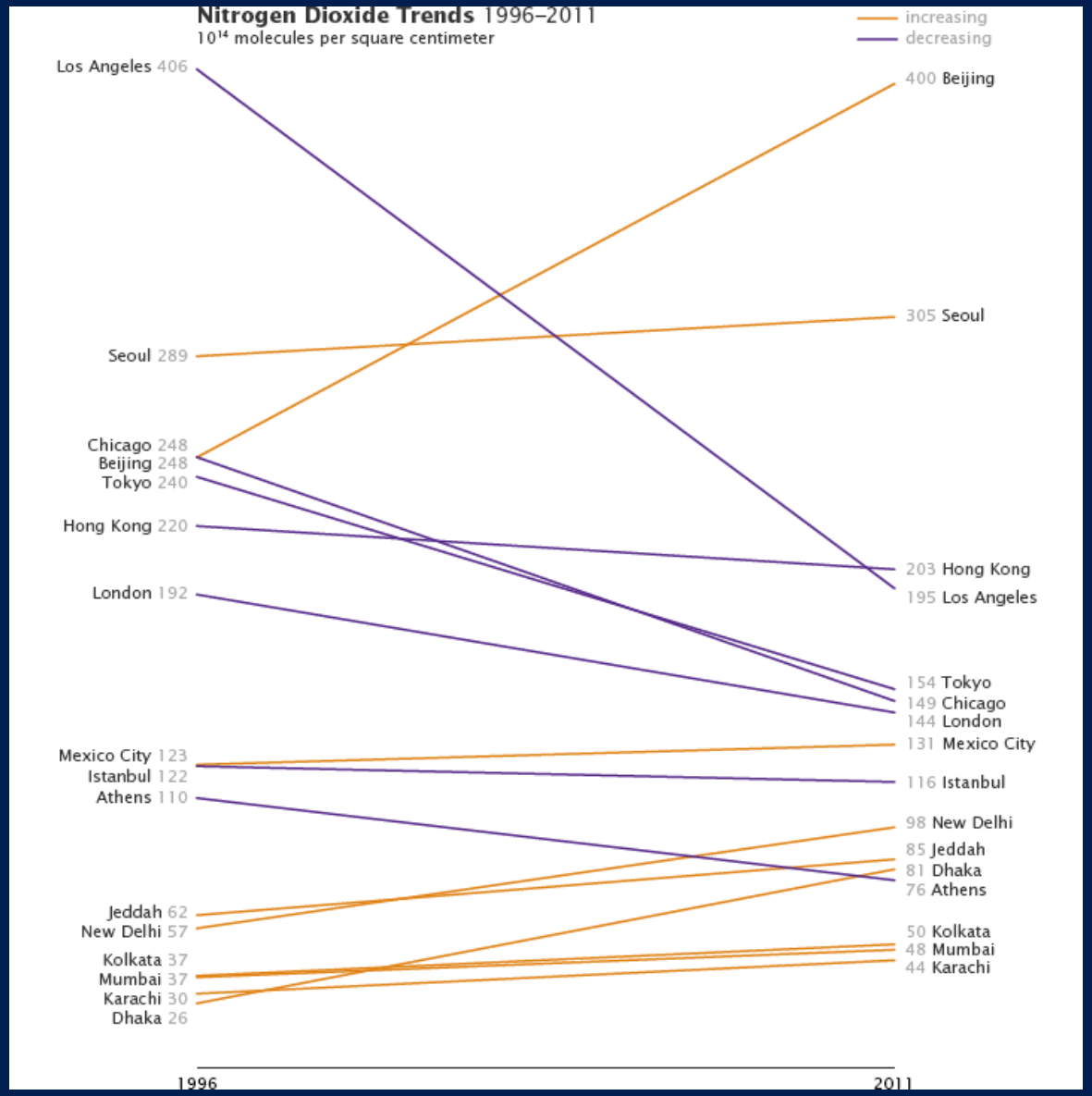
Aerosol Feature



These scanning electron microscope images (not at the same scale) show the wide variety of aerosol shapes. From left to right: volcanic ash, pollen, sea salt, and soot. [Micrographs courtesy USGS, UMBC (Chere Petty), and Arizona State University (Peter Buseck).]

Desert dust, volatile organic compounds from vegetation, smoke from forest fires, and volcanic ash are natural sources of aerosols. (Photographs copyright (left to right) Western Sahara Project, Jonathan Jessup, Vox, and Ludie Cochrane.)

Air Quality Trends Feature



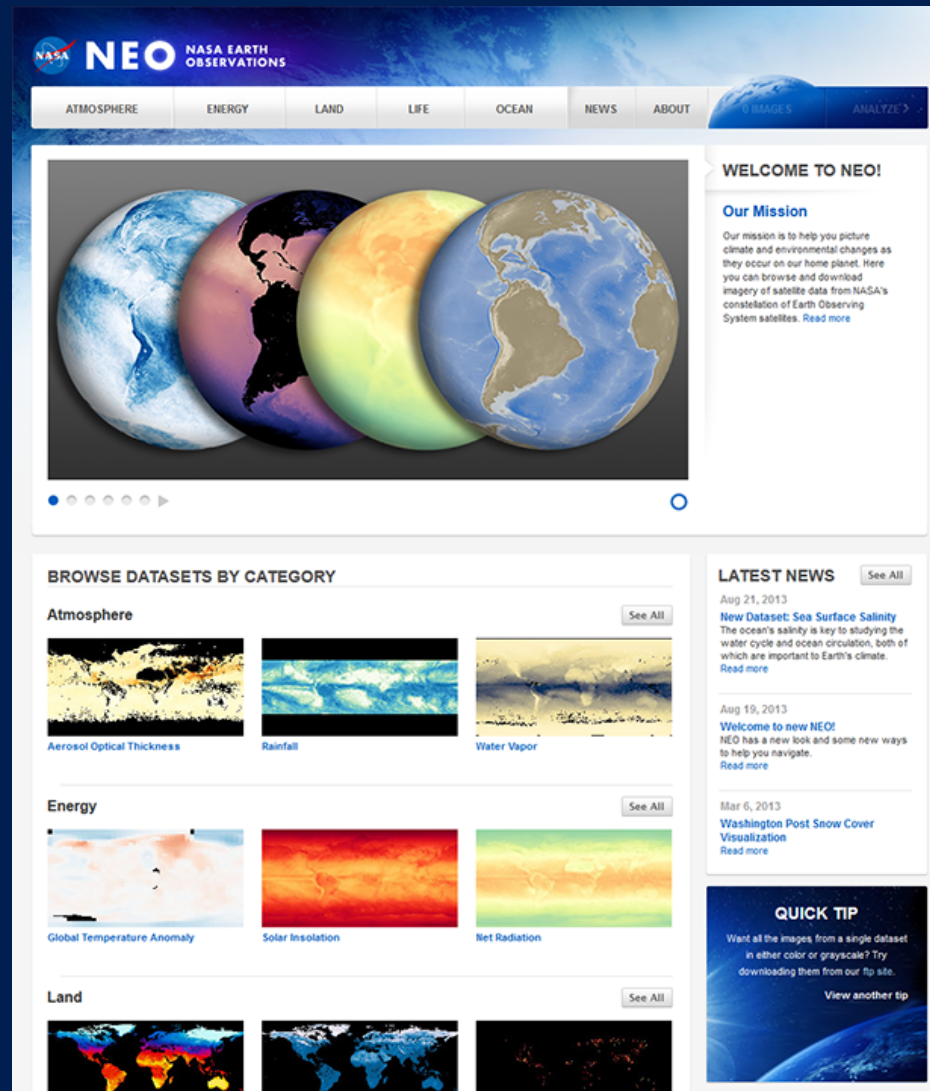
Nitrogen dioxide pollution increased strongly over cities in China, the Middle East, and India from 1996 to 2011. Western Europe, the United States, and Japan showed decreasing amounts over the same period. Monthly data shows these changes in more detail. [Graph by Robert Simmon, data provided by A. Hilboll/University of Bremen (Hilboll et al., 2013)]

Social Media

- 2-3 updates on Facebook per day
- 5-6 updates on Twitter per day (@NASA_EO)
- Also on Google+, Instagram, Flickr, YouTube
- Facebook especially popular in Asia.
- 1.6 million from India, 350K from the Philippines, 250K from Pakistan, 220K from Bangladesh, 89k for Nepal. (Compare to 760K for USA)

NASA Earth Observations (NEO)

- Repository of global data imagery
- 185k images from 50+ datasets/ parameters
- Includes aerosol optical depth, carbon monoxide, aerosol particle radius, ozone.
- Choose time period and download imagery. Designed for educational purposes, not research.
- http://neo.sci.gsfc.nasa.gov/



Other Resources

- MODIS Rapid Response Gallery
http://rapidfire.sci.gsfc.nasa.gov/gallery/

- EOSDIS Worldview
https://earthdata.nasa.gov/labs/worldview/

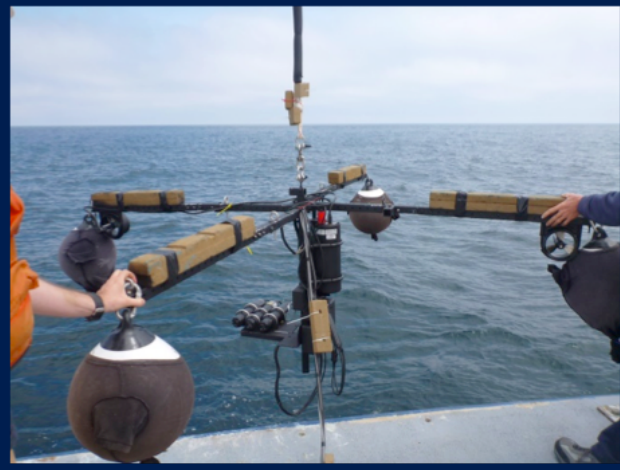
- Earth Explorer (Landsat, EO-1)
http://earthexplorer.usgs.gov/

Notes from the Field 2014

- Want to blog for us?
- Wordpress. Plug and play. Easy to use.

Past missions include:

- South Pacific Bio-optics Cruise
- Greenland Aquifer Expedition
- NASA in Alaska (G-LiHT, MABEL)
- Ship-Aircraft Bio-Optical Research (SABOR)
- LARGE (The Langley Aerosol Research Group Experiment)
- Hurricane and Severe Storm Sentinel (HS3)
- Operation IceBridge: Antarctic



Thank you. Questions?

adam.p.voiland@nasa.gov

@avoiland

Facebook

- 6.5M likes [836k]
- 322M total reach
- 707 posts (2-3/day)
- Avg post reach: 455k